

VALUE CHAIN ANALYSIS OF TOMATO: A CASE STUDY IN ANIS DISTRICT - DHAMAR GOVERNORATE, YEMEN

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ABSTRACT

This study considered an analysis of the value chain of tomato production and its related activities, conducted in Anis district - Dhamar governorate, to carry out a financial analysis of the whole chain in order to assess the added value and the distribution of profit margins between the different actors. This article maps and analyzes the tomato value chain in Anis District . Primary data was collected through a survey method adopting a multistage random sampling technique. The value chain highlighted the involvement of various actors, who directly or indirectly participated in the value chain. The different actors identified in the study area were input suppliers, farmers, traders, wholesalers, retailers and finally consumers. The result revealed that the main actors in the value chain are input suppliers, tomato producers, tomato pickers, small and large traders, processors and consumers. The market share of the producers shows that the producers get the largest share, which is 1350 YER. The main problems facing the tomato value chain are found to be low prices, high perishable nature, lack of access to credit, inadequate storage and processing facilities, lack of market information, and lack of financing for cultivation. While farmers rated low price as the most worrisome constraint, poor transportation facilities for the region producing tomatoes were rated as the most pressing constraint for value chain players.

KEYWORDS

Value chain analysis; ; production ; tomato ; Actors; Marketing Channel

1. INTRODUCTION

Anis District is a district of the Dhamar Governorate, Yemen. As of 2004, the district had a population of 61,444 inhabitant is characterized by mild climate in summer and cold in the winter and fertile soil and water supply which helps in the diversification of agricultural seasons, Where the tomato planting season started at the beginning of February to July. Tomato is an important crop in the agricultural economy of Yemen. It is the most widely grown vegetable crop in Yemen. Tomatoes are considered a labor-intensive crop, thus generating significant rural employment and increasing the income level and standard of living of the rural population. The objective of the study was to conduct a comprehensive analysis of the tomato value chain in Anis district, identify the opportunities and constraints of the actors and suggest possible solutions to improve the value chain. . Yemen's consumption has gradually dropped from 270,1000 tons in 2011 to 174,1000 tons in 2020. [1] Tomatoes and tomato-based foods provide a wide variety of nutrients and many health benefits to the body. Tomato contains higher amounts of lycopene, a type of carotenoid with antioxidant properties [2] which is beneficial in reducing the incidence of certain chronic diseases [3] such as cancer and many other cardiovascular disorders [4] Due to its palatability and vitamins, its demand in general is increasing day by day, while its production is far from the needs.

The specific objectives of the study are to:

- Identify value chain actors and assess their linkages and roles.
- Identify the amount of added value of the tomato value chain at each stage in the study area.

2. AGRICULTURAL VALUE CHAIN ACTORS

The agricultural value chain in general is made up of actors involved in tomato production, trade, transport, retail and processing. This study examined the value chain, including the links and relationships between actors, in particular the relationship between farmers and middlemen, producers, transporters, wholesalers, retailers and consumers, as well as the set of activities necessary to produce tomatoes from the farm to the final market.

2.1. Producers/Farmers

A farmer defined as a person who takes responsibility and makes a decision.

2.2. A Middle Man

A middleman is a person who collects different quantities of products from different producers and sells them to large traders, processors, retailers, processors or even exporters.

2.3. Wholesalers

They are known to buy large quantities of products with better financial and information capacity. They buy the product on the farm, from assemblers and/or at the roadside with a greater volume than any other marketer.

2.4. Retailers

Retailers sell small quantities of tomato products directly to individuals, households or institutional consumers. This function is performed by a wide range of actors, depending on the point of sale along the supply chain.

2.5. Consumers

Consumers are those who buy products to consume them [5]. This study was conducted to analyze the fresh tomato value chain, in order to generate important information useful to strengthen the tomato value chain and the relationships between the different actors. The study also attempts to determine tomato marketing costs, value addition and the distribution of profit margins along the value chain, which will improve the tomato marketing system.

3. METHODOLOGY OF THE STUDY

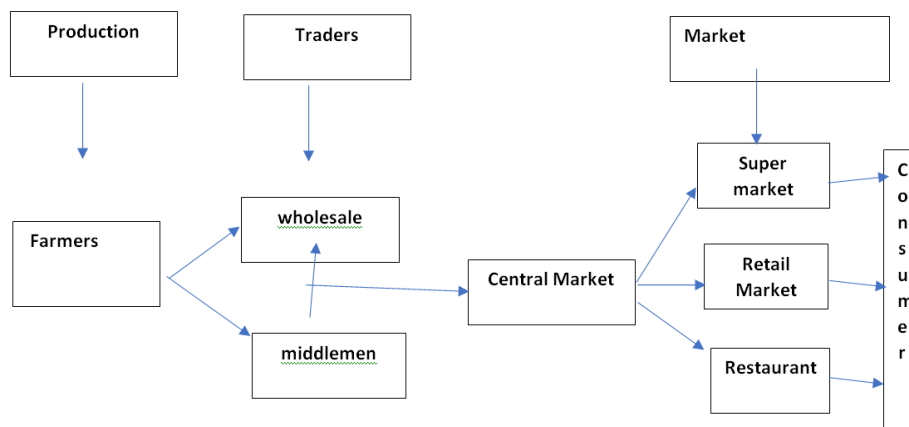
The study was conducted in Anis District o. The multi-stage sampling procedure was employed to select the sampling units of the study. Total sample size was 140 made up of 80 producers, 37 traders, and 13 consumers The tomato value chain analysis (VCA) was conducted by combining data from desk review of project related documents, field visits (household survey and focus group discussions with farmers) and individual interviews of chain actors and support institutions. Structured questionnaires were prepared for interviews of the surveys, FGDs and

marketing and processing agents. Finally, all actors of the tomato value chain were mapped; opportunities and constraints were identified; and recommendations were suggested as shown in the subchapters below.

4. RESULTS AND DISCUSSION

The value chain describes the full range of activities that companies and workers perform to bring a product from its inception to its end use and beyond. This includes activities such as design, production, marketing, distribution and end consumer support. The activities that make up a value chain can be contained in a single company or distributed among different companies [6]

Mapping of the tomato value chain according to McCormick and Schmitz [7]. value chain mapping helps to visualize the flow of the product from production to the final consumer through different actors. It also helps to identify the different actors involved in the tomato value chain and to understand their roles and linkages. Therefore, the current tomato value chain map in the study area is shown in Figure 1.



Key value chain actors identified include input suppliers, producers, collectors, farmer-traders, intermediaries, wholesalers and consumers. A brief discussion is given in the following subtitle below.

- **Farmers** tomato growers are smallholder farmers who perform most value chain functions from preparing agricultural inputs on their farms or purchasing inputs from other sources to handling and post-harvest marketing. The main value chain functions performed by tomato growers include plowing, planting, fertilizing, irrigation, weeding, pest/disease (mildew) control, harvesting, post-harvest handling and commercialization. The existing good agroecology has not been exploited by farmers due to the lower price they receive for their products in the markets, as well as bearing the cost of post-harvest losses
- **Wholesale** wholesalers are primarily involved in purchasing vegetables from collectors and growers in greater volume than any other player; and supply these vegetables to exporters, retailers and consumers. They also store the product, usually for up to three days. The result of the survey indicates that the wholesale markets are the main gathering centers for vegetables in their respective surroundings. They have better access to storage, transport and communication than other traders. Almost all wholesalers have a warehouse in a market either of their own or rented.
- **Intermediaries** play an important role in linking farmers to the market and other actors in the value chain, while the ability of farmers to access the market is limited and market

demand requires improvement in quantity as well as diversity types of products. Brokers sometimes go beyond facilitating transactions and tend to control and fix prices, create price symmetry and derive additional benefits from the process in addition to convincing farmers to sell their vegetables at fixed prices. by wholesalers.

- **Central Market** This is a central market in the region where vegetables are sold by wholesalers and middlemen after being collected and purchased from tomato growers.
- **Market** (supermarket, retail market and restaurant), they buy tomatoes from wholesalers and intermediaries, and then add value to the product. They generally often purchase more quantities due to the presence of storage materials such as refrigerators which increase the shelf life of the product.
- **Consumers** one of the actors in the tomato value chain who buys the products from growers, rural collectors and retailers for consumption. Rural dwellers, individuals, city dwellers, shopkeepers and hotels identified themselves as tomato consumers in the study.

4.1. Reasons for Growing Tomato

The sample farmers were asked to rank the reasons for cultivation of tomato and the same were analyzed and the results are presented in Table 1.

Table 1 : Reasons for growing tomato by sample farmers

No	Reasons for growing tomato	Rank
1	High levels of profit	1
2	Can be grown in all seasons	4
3	Favorable soil condition	3
4	Traditional cultivation	2

According to the sample farmer's high levels of profit stood first followed by Traditional cultivation , the favourable soil condition and suitability of tomato for cultivation during all seasons were the major reasons for cultivation of tomato in the study area

4.2. General Problems Faced by the Sample Farmers in Tomato Cultivation

The sample farmers were asked to rank the problems in cultivation of tomato and the same were analyzed and the results are presented in Table (2) . According to the sample farmers, pest and disease incidence stood first followed by Lack of weather forecast , Desal , Poor yield and non-availability of adequate water which were the next major problems in cultivation of tomato in the study area.

Table 2 : General problems faced by sample farmers in tomato cultivation

No	problems in cultivation of tomato	Rank
1	High incidence of pests and diseases	1
2	Non-availability of adequate water	5
3	Lack of weather forecast	2
4	Poor yield	4
5	Desal	3

4.3. Problems faced by Sample Farmers in Marketing of Tomato

The sample farmers were asked to rank the problems in marketing of tomato and the same were analyzed and the results are presented in Table 3

Table 3: Problems faced by sample farmers in marketing of tomato

No	Problems in marketing of tomato	Rank
1	Wide price fluctuations	1
2	Large commissions paid to commissions agents	3
3	Lack of market information	4
4	High transportation cost	2

According to the sample farmers, wide price fluctuations was the major problem followed by the High transportation cost , large commission paid to commission agents and lack of market information in marketing of tomato.

4.4. Reasons for Cultivating Hybrids

The reasons for growing a particular variety as perceived by the farmers were analyzed and the results are presented in Table 4. It could be seen that the 95 % farmers expressed the Pest and disease resistance as the major factor, which influenced them to grow tomato hybrid . It was followed by Keeping quality , Drought tolerance , physical characters such as size, shape and freshness of the fruit and High yielding .

Table 4 : Reasons for growing hybrid tomato

No	Reasons for cultivating hybrids	Rank
1	High yielding	5
2	Physical characters (size, shape and freshness)	4
3	Pest and disease resistance	1
4	Keeping quality	2
5	Drought tolerance	3

4.5. Source of Purchase of Fertilizers/Pesticides

The sources of purchase of inputs have a great influence on adoption level behavior of the farmers. It could be seen from Table 5 that 90 per cent of the farmers purchased fertilizers and pesticides from private shop. This is because farmers deal with the trader in the long-term payment system. About 10 per cent each of the farmers purchased from company representative. There is no farmers purchased from government and Agricultural associations.

Table 5: Source of purchase of fertilizers/pesticides

No	Sources	Total number of respondents	Percentage
1	Private shop	126	90
2	Agricultural associations	0	0
3	Company representatives	14	10
4	Government	0	0
	Total	140	100

4.6. Criteria for Grading Practices at Farm Level

Grading of tomato fruits was done (Table 6) on the basis of size (10 %) and Size, color and freshness (90 %).

Table 6 : Criteria for grading practices at farm level

No	Characters	Total number of respondents	Percentage
1	Size	14	10
2	Color	0	0
3	Freshness	0	0
4	Size, color and freshness	126	90
	Total	140	100

4.7. Storage of the Tomato

After grading, storage is very important in supply chain management. The main objective of storage after harvest is to control the rate of ripening to the extent of the marketing period. As tomatoes are sensitive, the recommended storage temperatures differ depending on the fruit maturity. A storage temperature of 130C with 90-95 per cent relative humidity is recommended for slow ripening. But in tomato due to perishables nature, long time storage is not possible. It could be found from Table 7 that 100 per cent of the farmers were selling the tomato fruits immediately after the harvest. They were transporting the fruits through tempos packed in plastic basket of 20 kg each.

Table 7: Storage of tomato before marketing

No	Practices	Total number of respondents	Percentage
1	Stored for 1-2 days	0	0
2	Sold immediately after harvest	140	100
	Total	140	100

At these markets the shelf life for tomatoes is only about 1 to 3 days. The stock lifetime for tomatoes at the supermarkets and hotels can go up to 10 days, depending on the quality of the tomatoes

4.8. Packaging Materials Used for Transporting

Preparation of produce for market may be done either in the field or at the packing house. Packaging protects the produce from mechanical injury, and contamination during marketing. The packing materials used for marketing of tomato from the field to market center are presented in Table 8. Majority of the farmers used plastic baskets of 20 kg (90 %) and 5% Non-packing in baskets (Directly placed on the ground loading cars for tomato crop).

Table 8 : Packaging materials used for transporting

No	Buyers	Total number of respondents	Percentage
1	Non-packing in baskets	7	5
2	Plastic baskets	133	95
	Total	140	100

The tomatoes are transported from farmers to wholesale markets in Dhamar or directly to the customers in case of the hotels and supermarkets. The transport is facilitated by the traders. There is no cold chain, and tomatoes are transported to the market in open trucks. The load factor of the trucks is high (see picture below) creating serious damage and losses.

The transport from farmers to the rural market is by small trucks or by Animales (Donky). Packaging is done in all sorts of baskets (plastic), which are carried on the trucks or on the back

of the animals (often heavily overloaded with direct exposure to the sun), These baskets carry up to 20kg of tomatoes and provide no protection during transport

4.9. Preferred Market Intermediaries

After production, farmers have to sell it as early as possible. The farmer’s preference of disposal is presented in the Table 9. Most of the farmers preferred wholesalers (60 %) followed by commission agent (35 %).

Table 9 : Preferred market intermediaries by sample farmers

No	Market intermediaries	Total number of respondents	Percentage
1	Commission agent	7	35
2	Wholesaler	12	60
3	Retail	1	5
	Total	20	100

The consumers mostly buy at the local markets or consume their own production. Urban consumers buy at the larger open air markets, or in small shop. As a result, the more modern retail outlets are gaining importance, such as supermarket, but also independent supermarkets such as Tawfeq super market and Al – kharbi super market . This market segment has higher quality standards compared to the traditional local markets.

Difficulties and constraints

- ✓ lack of access to credit, lack of access to storage facilities, lack of market information and lack of financing for agriculture.
- ✓ poorly developed markets and poor producer prices.
- ✓ Insufficient know-how and insufficient awareness of producers of the different types of pesticides and fertilizers
- ✓ Poor infrastructure and lack of irrigation
- ✓ Weak bargaining power against wholesalers due to lack of representation
- ✓ Lack of direct access by farmers to retailers and super markets

4.10. Identification and Evaluation of Marketing Channels for Tomato

Marketing channels of tomato For this study, the major marketing channels were identified. As a result, the best channel for tomato product flow in this study is the channel I, the farmers sold the tomato to the wholesaler. The wholesaler after grading the produce at the grading center located in the market transported and sold to the retailer in Dhamar market. The retailers in Dhamar sold to the consumers in the city.

Marketing channel I :

Producer → wholesaler → consumer

Marketing channel II :

Producer → commission agent → wholesaler → consumer

4.11. Marketing Costs, Margins and Price Spread

In the marketing cost of producers was 1350 YER of the consumer price of the tomato (Table 10). Major portion of the marketing cost of producers were packaging material charges 800 YER followed by transport charges 300 YER and harvesting, cleaning, grading packing and loading charges 250 YER.

The marketing cost of the wholesaler was 450 YER of the consumer price and majority of the expenditure was on packing, loading and unloading, cleaning, grading, weighing 300 YER, transportation charges 100 YER and spoilage charges 50 YER borne by the wholesaler.

The producers share in consumer price was 1150 YER / 20 KG , while the net margin of wholesalers was 2050 YER /kg of the consumer and the Net margin of retailer was 750 YER / 20 kg to the consumer price of the tomato.

Table 10 :- Price spread for the identified marketing channels of tomato

Particulars	price/ 20 kg
Marketing cost of tomato growers	
Harvesting, grading, packaging and loading	250
Packaging material cost	800
Transportation	300
Sub-total	1350
Sale price of tomato growers	2500
Net price received by the tomato grower	1150
Purchase price of wholesaler	2500
Loading and unloading, grading, weighing and packaging and loading	300
Transportation	100
Spoilage 2 %	50
Margin of wholesaler	2050
Sub-total	450
Purchase price of retailer	5000
Marketing cost of retailer	
Loading and unloading, grading, weighing and loading	50
Transportation	100
Spoilage 2 %	100
Margin of retailer	750
Sale price of retailer	6000

Itinerant wholesalers purchase the tomatoes directly from the farmers along the road or at rural markets. They know exactly where the produce can be sourced during a certain period of the year, and to be more precise, during which day of the week. Due to lack of capacity of farmer to trade directly on the market farmers receive a low price for their produce, a farmer is paid between 2500- 3000 YEM per 20 kg by the trader and at the wholesale market the tomatoes are sold by the trader for 5000 YEM per 20 kg. . Collection and transportation costs are an important part of the price difference.

Almost all tomatoes are sold in the day-to-day market, where there are no facilities to cool and store tomatoes. In Dhamar there are a number of large wholesale markets. One of the leading markets Central Market. Travelling wholesale traders bring their goods in the early morning. On the market, the tomatoes (also some leftovers from the day before) are sold to retailers. Small traders often sell fruits and vegetables to consumers. However, restaurant owners also buy their

products in these markets. Tomatoes are sold on substrates covered with a basic sunscreen. Often, products are unsorted and unwrapped on plastic

As discussed before, the current productivity is well below potential, and income levels in agriculture are low. Most farmers do not provide support in activities such as marketing, sorting, storing and grading. This leads to limited bargaining power towards traders. In addition individual farmers don't have the capacity to trade directly on the wholesale market, since they are not able to organize transportation and they lack the time and skills to do business at the wholesale markets.

The most challenging problems are: price fluctuations and lack of logistics for the cooling chain

5. SUMMARY AND CONCLUSIONS

The recommendations to be drawn from this study are based on the value chain mapping, opportunities, constraints and important variables in value chain analysis. There must be a strong and clear relationship or vertical links between or among the main actors in the chain. The relevant governmental and non-governmental institutions should be in place to facilitate the development of the value chain. Significant post-harvest losses occur along the tomato value chain with adverse effects on the income of small farmers and traders. Forms of damage include physical or mechanical damage, disease and/or insect pest infections, and/or poor shape, color and size of the product or combinations of these factors. At the farm level, post-harvest loss is a continuum of disease and pest attacks, lack of access to appropriate tools and skills during harvest, and poor post-harvest handling. Post-harvest loss that occurred at one point in the value chain extends to other actors in the chain and is also exacerbated along the value chain due to poor handling, transportation, storage and ambient temperature deteriorating product quality. There are no facilities for processing and marketing fresh produce such as refrigeration facilities. To reduce post-harvest losses of tomatoes, serious interventions are needed, including building skills to improve post-harvest management practices, post-harvest handling capacity including cold storage, and improved market information, facilities and services. In line with the results of this study

Summary and Conclusions

The issues to be applied for better tomatoes growing and marketing can be summarised as follows

The formation of marketing cooperatives would allow farmers to market their products together to meet the individual constraints of small commercial production, small transport sizes and high transport costs in order to attract and enter high value markets.

- ✓ Improve farmers' know-how and the application of post-harvest handling techniques through capacity building workshops
- ✓ The proposed cooperative can introduce sorting and classification services to be performed by women on outsourced services
- ✓ Introduce contract farming between producers and factories.

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